



# QUALITY ASSURANCE DOCUMENT

## FOR A

### SMALL WASTEWATER LAB

3rd Edition April, 1999

Prepared by:

WISCONSIN DEPARTMENT OF NATURAL RESOURCES  
101 S. Webster Street  
PO Box 7921  
Madison, WI 53707

**PUBL- SS-942-99**



## **WISCONSIN NATURAL RESOURCES BOARD**

Trygve A. Solberg, Chair	Minocqua
James E. Tiefenthaler Jr., Vice Chair	Brookfield
Herbert F. Behnke	Shawano
Schneider, Neal W., Secretary	Janesville
Betty Jo Nelsen	Oconomowoc
Howard D. Poulson	Madison
Stephen D. Willett	Phillips

## **DEPARTMENT OF NATURAL RESOURCES**

George E. Meyer, Secretary

Darrell L. Bazzell, Deputy Secretary

Francis M. Fennessy, Executive Assistant

## **DIVISION OF ENFORCEMENT AND SCIENCE**

David J. Meier, Administrator

Bureau of Integrated Science Services

James T. Addis, Director

Analytical & Statistical Science Services Section

John R. Sullivan, Chief

## **DIVISION OF WATER**

Susan L. Sylvester, Administrator

Bureau of Watershed Management

Al Shea, Director

## Authors:

1<sup>st</sup> edition

Carol Johnson  
Tom Mugan  
Linda Vogen  
Rick Mealy

formerly Madison Central Office  
Madison Central Office  
Northeast Region (Green Bay) Office  
Madison Central Office

2<sup>nd</sup>, 3<sup>rd</sup> editions

## EXECUTIVE SUMMARY

The Quality Assurance Document For A Small Wastewater Lab provides a condensed version of Code requirements as well as information regarding the essential elements of a quality control program in a wastewater laboratory. We have compiled a set of tools which the wastewater labs can use to ensure the generation of quality data. In addition, this document serves as an excellent resource to complement the training of new technicians at wastewater laboratories. This manual is not designed to be a complete guidance document for commercial laboratories, as it is written based on the analytical testing requirements associated with wastewater only.

## ACKNOWLEDGEMENTS

In addition to the DNR staff from the various offices who provided assistance in writing, reviewing and providing suggestions for the document, there are also a number of external individuals, including the staff of the plant that served as the model for this document, who provided insight into wastewater laboratory operations.

The following individuals are acknowledged for having made significant contributions over the history of this document:

### **1<sup>st</sup> edition (1989)**

Carol Johnson ..... (formerly) Madison Central Office  
Tom Mugan ..... Madison Central Office  
Linda Vogen ..... Northeast Region Office

### **2<sup>nd</sup> edition (1992)**

Rick Mealy ..... Madison Central Office

### **3<sup>rd</sup> edition (1998)**

Rick Mealy ..... Madison Central Office

There are also a number of individuals, including personnel from the treatment facility serving as the model, who provided information, advice, or assisted in the review process. Many of the Staff members at the Lab Certification Central Office and Regional Certification Officers also provided input for this latest version of the manual. John Condrón, in particular, provided initial editing of the document for consistency with recent changes in Administrative Code and authoritative sources. The end result is the production of a document which will be invaluable to both the DNR staff and wastewater laboratory personnel as both a reference and guidance document.

## PREFACE

Here is a copy of the quality assurance plan for the laboratory at the Tree City Wastewater Treatment Facility. Quality assurance plans similar to this one are very valuable to maintaining analytical performance and assuring compliance with the requirements of NR 149, the Laboratory Certification and Registration Code.

This third revision to the Quality Assurance Document For A Small Wastewater Lab comes as a result of the joint efforts of a number of individuals over the last six years. While the main focus of this revision was to include recent changes to chapter NR 149 of Wisconsin's Administrative Code, we are also responding to a perceived need for additional information. Over the last several years, discussions with operators during on-site evaluations has helped to identify the type of information that would be most beneficial to these laboratories. Consequently, a concerted effort was made here to further expand on specific topics related to quality assurance and quality control.

This material is being distributed as guidance for use by laboratory personnel regarding elements of a quality assurance program. The Tree City facility is a small to medium sized (about 2.0 mgd of combined domestic and industrial wastewater). Only the essential elements of a quality assurance document are included in this "model" plan. Therefore this represents what might be considered a minimum program. Some laboratories may choose to expand this by providing more detail.

Please note that, where details are provided, they are specific to Tree City. The elements comprising the program are generic, however. Please use as much or as little of this material as you wish.

In addition to an application and payment of fees, NR 149 requires:

1. Following approved methods of analysis.
2. Using approved methods for sample collection, handling, and preservation and performing all testing within regulatory holding times.
3. Analyzing and passing at least one reference sample per year for tests that require them.
4. Preparation and adherence to a written Quality Assurance Plan.
5. Performance of quality control samples including analysis of blanks, blind standards, known standards, spikes and replicates.
6. Documentation which substantiates that requirements are being met. Records must be retained for at least three years.

This "model" quality assurance plan incorporates all of these essential ingredients. If the resulting program is followed, your laboratory will be well on its way to generating quality data and compliance with the Lab Certification/Registration rules. Perhaps more importantly, quality data will allow you to make better operations decisions, avoiding unnecessary delays and expense!

---

**Editor's Note:** *This document constitutes the third edition of "A Quality Assurance Manual for a Small Wastewater Lab". This third edition includes the reorganization of the Department of Natural Resources and other clarifications, updates, and additions. Specific products and brand names listed in this manual are given as examples only and do not represent an endorsement by the Wisconsin Department of Natural Resources. The fictitious name of this community has been changed to Tree City in this edition.*

# Table of Contents

1. INTRODUCTION	1
2. MONITORING PROGRAM	1
Industrial Monitoring	1
3. SAMPLING	2
Sampler Cleaning	2
4. ANALYSES	4
5. QUALITY ASSURANCE & QUALITY CONTROL	6
Quality Control Measures	7
Lab Facility Cleanliness	7
Personnel Training	7
Equipment Maintenance	7
Analytical Reagents	8
Reagent Water Quality	8
Labware Cleaning	8
Instrument Calibration	8
Quality Control Analyses	9
Blind Standards	9
Known Standards	10
Reference Samples	10
Calibration	10
Pre-Programmed Calibrations	10
Hand-drawn Calibration Curves	12
Scientific Calculators	12
Computer Software	12
Determining the Limit of Detection (LOD)	13
Choosing the appropriate spike level	13
Calculations	13
Frequency of LOD determination	13
The 5-Point Check	14
Exempt Analytes	14
Specific Examples (BOD, TSS, Ammonia, Phosphorus)	15
Evaluating Accuracy (Matrix Spikes)	16
Evaluating Precision (Replicates)	21
Using Control Limits Appropriately	22
Fine-tuning Control Limits	22
Identifying Outlier Data	23
Quality Control Charts	24
Evaluating Quality Control Charts	25
Relating accuracy & Precision to Data Quality	26
Corrective Action	27
Last resort - Qualifying your results	27
Documentation and Record-Keeping	28
6. REPORTS	28
Influent/Effluent Monitoring Program	29
Discharge Monitoring Reports (DMR)	29
Special Reports	29
Compliance Maintenance Annual Reports (CMAR)	29
Sludge Characteristics Reports	29
Agricultural Site Characteristics Reports	29
Disposal Records Reports	29
7. REFERENCES	30